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Modeling of Recipes for Specialized Baby Food Products

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Abstract: The article discusses some aspects of the development and creation of science-based specialized baby food products based on natural ingredients with balanced recipes. Specialized physiological food components include biological substances for which the properties and norms of daily consumption that are useful for preserving and improving health have been identified and justified. Their effect on the body should be justified by the physiological effect on the biological processes of the body. The most effective and useful components are those of natural origin. These include dry water-soluble extracts of fruits and plants as well as vegetable powders. The article contains a research on the development of the formula composition of fermented milk specialized products for baby food. The use of vegetable raw materials enables the obtainment of compositions with improved vitamin, mineral, carbohydrate and amino acid composition. Specialized baby food products with a combined composition based on animal and vegetable raw materials are most balanced in terms of macro-and micronutrient composition. The results of the research provide opportunities to develop optimal technologies for the production of specialized baby food products in various forms. The paper contains some justifications for the use of advanced components of specialized baby food products based on natural substances and the creation of product forms.

Keywords: specialized products, microbiome, baby food, plant extracts, starter cultures.

The full development and healthy state of a child in all periods of its development requires the formation of a certain balanced amount of necessary biological substances in food products. Several dozen fundamentally necessary biological nutrients (lat. Nutrio - nutrition) have been established.

Many of them are not produced by the body and must come from outside through food.

The list of essential nutrients is included in nutritional standards and are necessary in the preparation of rations and diets. Their consumed quantity is regulated by recommended consumption standards.

The usual diet of baby food does not always provide the child's body with the necessary nutrients in sufficient and balanced quantities. This need especially increases in conditions of environmental, microbiological and social negative impacts. At the same time, to maintain the health and harmonious development of a child in modern conditions, a certain set of specialized nutritional components is required.

Lack and unbalanced supply of essential nutrients leads to various disorders in the development of the child's body and painful conditions.

Specialized baby food products should contribute to the preservation and strengthening of health, normal functional development of the child, provide a targeted physiological corrective effect, and contribute to the normalization of the body's microbiome . They must contain a balanced amount of essential macro- and micronutrients and have no negative side effects.

Traditionally, vitamin and mineral complexes are used as nutrients for the prevention and correction of functional disorders.

However, this approach does not always lead to the desired positive results and correction of violations.

Physiological specialized food components should include biological substances for which properties and daily consumption standards have been identified and justified, useful for maintaining and improving health. Their manifestations must be justified by a physiological effect on the biological processes of the body.

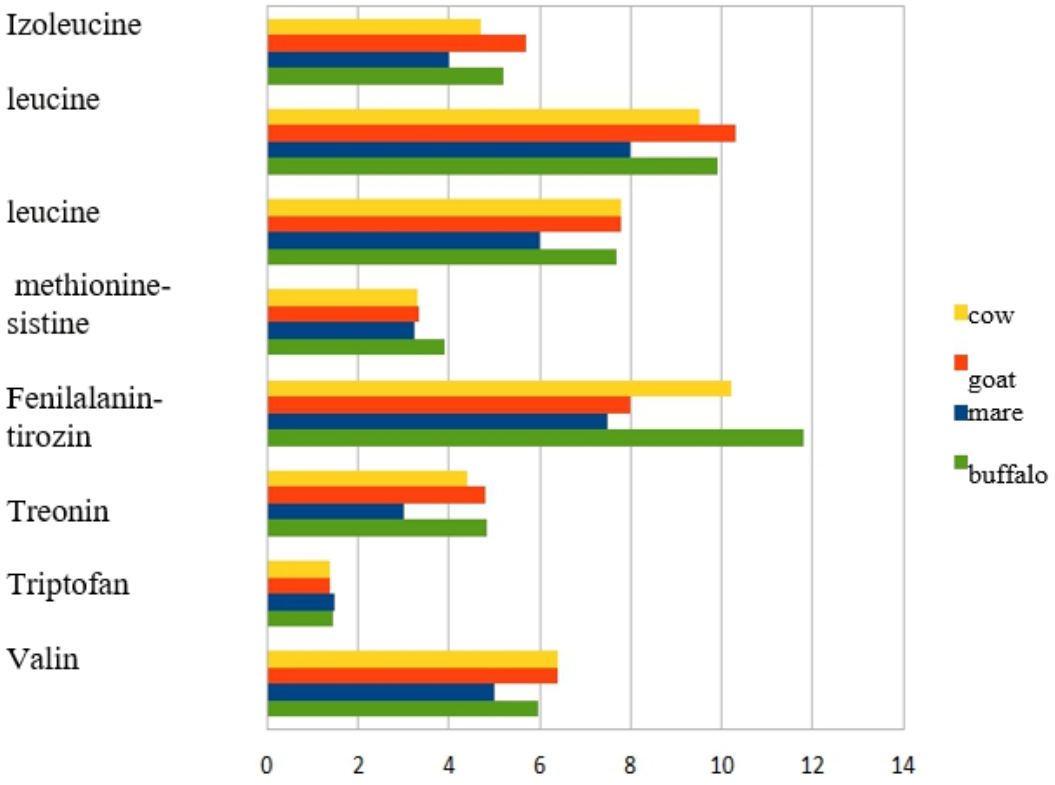
The most effective and useful components are of natural origin.

Fermented milk products of specialized baby food have their own advantages. One of them is the physiological form of the product. In the process of phylogenesis, dairy products play a critical role in the process of bioavailability of essential nutrient components. The child's digestive system, with its multifaceted enzyme system, allows not only to quickly and efficiently absorb fermented milk foods, but also to form new individual compounds necessary for the child's body.

Research has been carried out to create specialized products for baby food with a combined composition.

To conduct research, dairy raw materials of various types of farm animals were studied: cow, goat, mare and camel.

Their amino acid composition was assessed, the results are presented in the diagram (Picture- 1).



Picture-1 – Amino acid composition of cow, goat, mare and camel milk

This diagram shows the differences in the amino acid composition of cow, mare, goat and camel milk, which confirms the advisability of combining the milk of these animals to create complete and balanced baby food products.

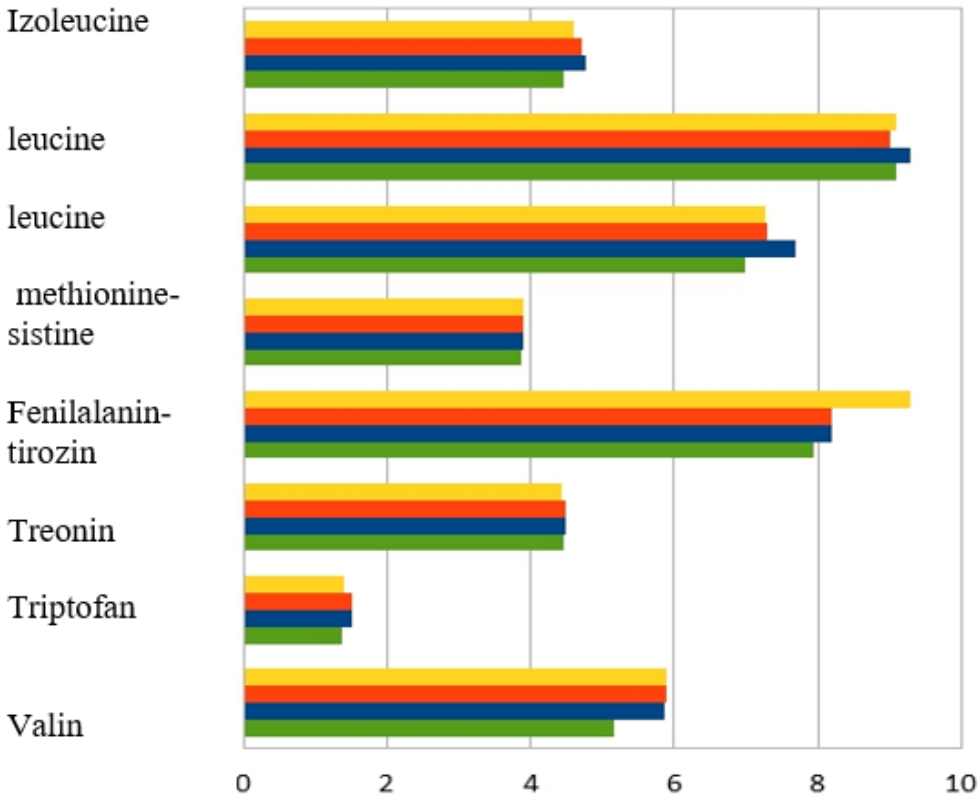
Research has been carried out to create various combinations of the three types of milk. Compositions consisting of cow, goat, mare and camel milk were selected in certain proportions in order to bring their amino acid composition closer to the standard for feeding children 1.5 years of age. For the study, three compositions of mixtures were selected, consisting of combinations of milk in certain proportions:

1- cow, goat, mare's milk, ratio 4:1:1.5;

2- cow, goat, mare's milk, ratio 5.5:1:1;

3- goat, mare, camel milk, ratio 2.5:1:1.5.

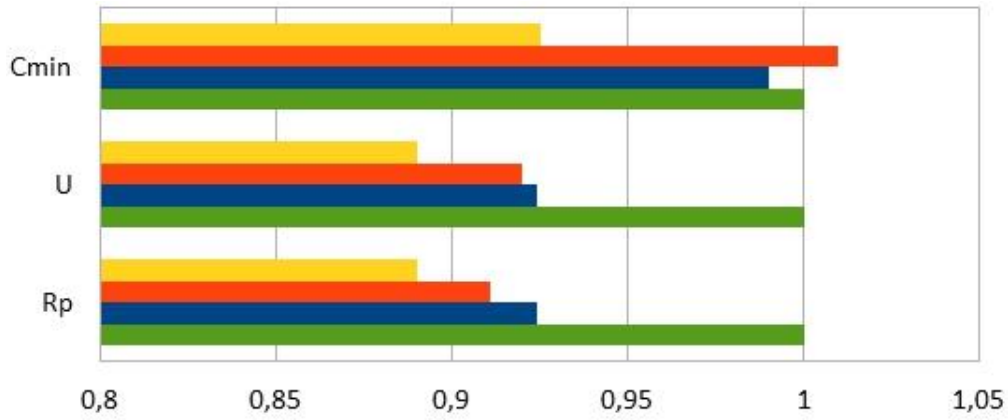
A comparative assessment of various compositions with a protein standard for children 1.5 years old in terms of amino acid composition is presented in the diagram (Picture- 2).



Picture- 2 – Amino acid composition of milk compositions and protein standard for children 1.5 years old

As can be seen in the diagram, the amino acid composition of the compositions is close to the reference values.

Indicators of the amino acid balance of compositions, namely: indicators of the rationality of the amino acid composition, which numerically characterize the balance of essential amino acids in relation to the physiologically necessary norm (standard); A comparative assessment of the amino acid balance of three milk compositions with the standard is presented in the diagram (Picture -3).



Picture-3 – Amino acid balance of milk compositions and standard protein for children 1.5 years old.

The diagram shows that compositions 1 and 2 have the highest levels of amino acid balance, in which the amino acid score is 0.99-1.01% units.

Based on the data obtained, composition 1, consisting of cow, goat and mare's milk, was chosen as a product based on three types of milk, maximally balanced in amino acid composition. This combination will serve as the basis for the creation of new baby food products with high biological value.

Rationale for the development of the recipe composition of a specialized fermented milk product

Research on the development of the recipe composition of a specialized fermented milk product in the form of yogurt was carried out in three directions:

- selection of the optimal ratio of milk combinations;
- selection and determination of dosage of vegetable powders;
- selection of starter cultures with optimal parameters.

To develop the recipe composition of yogurt, 3 types of milk combinations, 3 types of vegetable powders and 4 types of starter cultures for each combination were used. 36 intermediate formulations were developed, from which product samples were obtained. During the ripening of the product, the main parameters were recorded that subsequently influenced the choice of the optimal starter : ripening temperature, ripening time, change in the acidity of the product over time. Organoleptic evaluation of the samples was carried out on a 10-point scale by a tasting commission of 10 people. The assessment was carried out according to the following parameters: smell, color, consistency, taste.

The chart data shows that samples with pumpkin powder have the highest scores. Moreover, yogurt based on a combination of cow and goat milk has slightly higher ratings than samples based on a mixture of cow and mare's milk, as well as goat and mare's milk. This is due to the specific taste of milk from goats and mares. The samples with carrot powder received the lowest ratings, since the products had a specific unpleasant aftertaste and aroma. The yogurt had a gray tint and small inclusions of powder in the structure. Samples with beet powder have indicators slightly inferior to samples with pumpkin, but overall they have a good rating, this is due to the high intensity of beet aroma and taste. Subsequently, the recipes for yogurt with beet powder were adjusted (the content of vegetable powder was reduced), samples were made and a tasting assessment was carried out, as a result the product was highly appreciated and was approved for further research.

Based on the parameters fixed during the ripening process of the product, as well as subsequent organoleptic evaluation, the optimal starter cultures for each of the recipes were selected.

To adjust the taste of the product, sugar is added to the recipe in the following quantities: 2% for recipes with pumpkin powder and 3% for beet powder. As an additional source of carbohydrates and structure-forming agent, the formulations include maltodextrin in an amount of 2%. Table 1 shows the working recipes for yoghurts with vegetable powders.

Table 1 - Recipe composition of yoghurts

Ingredients, kg	cow+goat		cow+mare		goat+mare	
	pumpkin	beet	pumpkin	beet	pumpkin	beet
Cow's milk	650	650	650	650	-	-
Goat milk	280	280	-	-	650	650
Mare's milk	-	-	280	280	280	280
Maltodextrin	20	20	20	20	20	20
Sugar	20	thirty	20	thirty	20	thirty
Pumpkin powder	thirty	-	thirty	-	thirty	-
Beet powder	-	20	-	20	-	20

Samples of yogurt of 6 recipes are sent for additional research on the content of beta-carotene, dietary fiber, as well as to study the amino acid composition. Preliminary analytical studies of the product were carried out, the data are shown in Table 2.

Table 2 - Chemical composition of yoghurts (analytical data)

Indicators, g/100g	cow+goat		cow+mare		goat+mare	
	pumpkin	beet	pumpkin	beet	pumpkin	beet
Protein	3.07	2.99	2.82	2.74	2.82	2.74
Fat	3.06	3.05	2.50	2.49	2.63	2.62
Carbohydrates	9.30	10.49	9.58	10.77	9.58	10.77
β-carotene, mg	11.81	0.66	11.74	0.59	11.88	0.73
Dietary fiber	0.48	0.25	0.48	0.25	0.48	0.25
Calorie content, kcal	77.00	81.32	72.07	76.39	73.24	77.56

Conclusion

Specialized baby food products with a combined composition based on animal and plant raw materials are the most balanced in terms of macro- and micronutrient composition. When developing the recipe composition of specialized fermented milk products for baby food, it should be taken into account that the use of plant raw materials helps to obtain compositions with an improved vitamin, mineral, carbohydrate and amino acid composition. Raw materials of plant origin are a natural source of beta-carotene and dietary fiber. Combining milk from different types of farm animals with different nutrient composition makes it possible to obtain products that are balanced in chemical and amino acid composition.

As part of the research:

- cows , goats and mares - serve as the raw material base ; Vegetable powders obtained by thermolabile drying are used as a source of beta-carotene and dietary fiber; Maltodextrin is used as an additional source of carbohydrates, as well as a structure-forming agent ; the optimal types of starter cultures for each recipe composition were selected;
- 6 yogurt recipes of combined composition have been developed;
- product samples were sent for additional studies of amino acid composition, beta-carotene content and dietary fiber.

Recommended specialized baby food products based on plant extracts have been developed.

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